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PROBLEMS AND SOLUTIONS.

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PROBLEMS FOR SOLUTION.

ALGEBRA.

455. Proposed by JOS. B. REYNOLDS, Lehigh University.

Solve for x_n (not in determinant form) the simultaneous equations,

$$\tfrac{4}{3} x_n + 2x_{n-1} + 2x_{n-2} \cdots 2x_4 + 2x_3 + 2x_2 + 2x_1 = g,$$

$$\tfrac{10}{3} x_n + \tfrac{22}{3} x_{n-1} + 8x_{n-2} \cdots 8x_4 + 8x_3 + 8x_2 + 8x_1 = 4g,$$

$$\tfrac{16}{3} x_n + \tfrac{40}{3} x_{n-1} + \tfrac{52}{3} x_{n-2} \cdots 18x_4 + 18x_3 + 18x_2 + 18x_1 = 9g,$$

$$\tfrac{22}{3} x_n + \tfrac{58}{3} x_{n-1} + \tfrac{82}{3} x_{n-2} + \tfrac{94}{3} x_{n-3} \cdots 32x_4 + 32x_3 + 32x_2 + 32x_1 = 16g,$$

$$\tfrac{28}{3} x_n + \tfrac{76}{3} x_{n-1} + \tfrac{112}{3} x_{n-2} + \tfrac{136}{3} x_{n-3} + \tfrac{148}{3} x_{n-4} \cdots = 25g,$$

. . . .

$$(\tfrac{1}{3} + 2n - 1)x_n + (\tfrac{1}{3} + 6n - 5)x_{n-1} + (\tfrac{1}{3} + 10n - 13)x_{n-2}$$
$$+ (\tfrac{1}{3} + 14n - 25)x_{n-3} \cdots (\tfrac{1}{3} + 2n^2 - 1)x_1 = n^2 g.$$

456. Proposed by PAUL CAPRON, U. S. Naval Academy.

If

$$S_{i,n} = \sum_{k=1}^{k=n-i+1} \frac{(i + k - 1)!}{(k - 1)!},$$

show that $S_{i,n}$ is equal to $1/(i + 1)$ times the last term of $S_{i+1,n+1}$; as, for instance, that

$$S_{1,n} = 1 + 2 + \cdots + n = \frac{n}{2}(n + 1),$$

that

$$S_{2,n} = 1 \cdot 2 + 2 \cdot 3 + \cdots + n(n + 1) = \tfrac{1}{3}(n - 1)n(n + 1),$$

etc.

GEOMETRY.

486. Proposed by ARON INGVALE, Brooklyn, N. Y.

Does the following construction trisect an angle? With the vertex, O, of the given angle as center and with a radius R, describe a circle intersecting the sides of the given angle in A and B. With a radius $\tfrac{3}{4}R$, and center on OA, describe a circle tangent to the other circle at A and cutting the other side of the angle at E. At E draw a tangent to the last circle and produce it to meet the first circle at F. Draw FO. Then is angle BOF one-third of the angle BOA?

REMARK. Though the construction does not, of course, lead to the trisection of an angle in general, yet as a first approximation it is very good. This fact together with the fact that the construction is very simple, and that the proposer's demonstration that it does trisect the angle is very illusive, are the reasons for giving the problem a place in the MONTHLY.

EDITORS.

487. Proposed by H. B. PHILLIPS, Massachusetts Institute of Technology.

If segments from the vertices A and B of a triangle to the opposite sides are of equal length and divide the angles A and B (measured from AB) proportionally, the triangle is isosceles.